PATENT ABSTRACTS OF JAPAN

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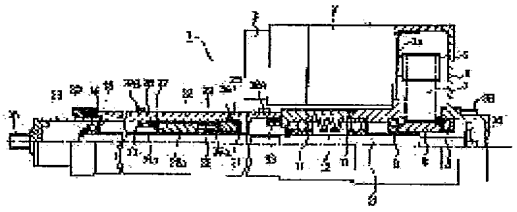
(71)Applicant : CKD CORP
(72)Inventor : YAMANO KENJI
TANAKA HIROSHI
OTANI OSAMU
ITOU SHIN

(54) MOTOR-DRIVEN CYLINDER

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a motor-driven cylinder in which good engagement of a screw part at a thrust nut and at a thrust shaft is maintained, whose rigidity is high and is low-cost.
SOLUTION: A motor-driven cylinder 1 is provided with a drive motor 2 which gives a rotational output, with a thrust shaft 21 which comprises an external thread 21a supported inside a frame 29 to be freely rotatable, with drive transmission means 4, 6, 7 by which the rotational output of the drive motor 2 is transmitted to the thrust shaft 21, with a thrust nut 22 which comprises an internal thread 22a to be screwed to an external thread 21a at the thrust shaft 21 and with a thrust rod 23 which is installed to cover the external thread 21a which is installed to protrude in the direction of a shaft from the frame 29 to be freely slidable. The thrust rod 23 whose diameter is larger than that of the thrust nut 22 is situated between a coupling and a stopping part 26 formed on its inner side face and a coupling and stopping member 25 which is fitted to an end part, so as to hold the thrust nut 22 in the direction of the shaft by a frictional force.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]It has a thrust nut and a thrust rod which covered with said male screw and protruded on shaft orientations from said frame enabling free sliding characterized by comprising the following, A motor cylinder, wherein said thrust rod which made a major diameter and was formed from said thrust nut holds said thrust nut according to frictional force to shaft orientations between a suspending portion formed in the medial surface, and a locking member which fitted into an end.
A drive motor which gives a rotational output.
A thrusting shaft which was supported enabling free rotation and was provided with a male screw in a frame.
A drive means of communication which transmits a rotational output of said drive motor to said thrusting shaft.
A female screw screwed in a male screw of said thrusting shaft.

[Claim 2]Have a thrust nut with a flange characterized by comprising the following, and the thrust rod which covered with said male screw and protruded on shaft orientations from said frame enabling free sliding, and said thrust nut, A motor cylinder which a locking member fixed to said thrust rod side to a breakthrough drilled by flange with which it was loaded with axial clearance fits in loosely, and is characterized by said thrust rod being the cylinder body which made a flange outer diameter of said thrust nut, and of approximately the same diameter, and was formed.
A drive motor which gives a rotational output.
A thrusting shaft which was provided with a male screw and supported in a frame enabling free rotation.
A drive means of communication which transmits a rotational output of said drive motor to said thrusting shaft.
A female screw screwed in a male screw of said thrusting shaft.

[Claim 3]A motor cylinder, wherein said thrust rod is formed with a light metal in the motor cylinder according to claim 1 or 2.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]The rotational output of an electric motor is changed into a straight-line motion, and it is related with the motor cylinder which can output a straight-line motion comparable as an air cylinder.
[0002]
[Description of the Prior Art]The motor cylinder is widely adopted as a mechanism which changes the rotational output of a motor into a straight-line motion from the former. drawing 2 showed the conventional motor cylinder -- it is a sectional view in part. The motor cylinder 101 is making the composition that the rotational output of the drive motor 102 is transmitted to the cylinder part which outputs a straight-line motion. As for the drive means of communication, the timing belt 105 is stretched between the driving shaft side sprocket 103 and the driving-side sprocket 104. The driving-side sprocket 104 is fixed to the thrusting shaft 106 supported enabling free rotation, and the male screw 106a is formed in the thrusting shaft 106. The male screw 106a is screwed in the female screw 108a of the thrust nut 108, and the thrust rod 109 is being fixed by the thrust nut 108 on the same axle. The coupling 110 intervenes between the thrust rod 109 and the thrust nut 108, and both screw in the coupling 110, are concluded firmly, and have become a thing of one. It is covered with the frame 111, the thrust rod 109 is supported by the bracket 112, enabling free sliding, and the thrusting shaft 106 and the thrust rod 109 protrude from frame 111 tip.
[0003]And in the motor cylinder 101 of such composition, by the drive of the drive motor 102, a rotational output will be transmitted to the thrusting shaft 106 via the timing belt 105, and rotation will be given to the male screw 106a. If the male screw 106a rotates, a thrust will be given to the thrust nut 108 screwed in the male screw 106a, and the thrust rod 109 which was united via the coupling 110 will move to shaft orientations. The move direction is determined by the hand of cut given to the male screw 106a.
[0004]
[Problem(s) to be Solved by the Invention]However, since the thrust nut 108 and the thrust rod 109 screwed in the coupling 110 and were concluded firmly, such both conventional motor cylinders 101 had the problem that an allophone cannot be emitted, or generation of heat and anomalous attrition by an oil film piece happened, and sufficient function could not be exhibited. That is, when the angle has come out in neither the case where the thrust rod 109 and the thrust nut 108 are not formed on the same axle, nor a concluded face, the male screw 106a and the female screw 108a are because what is called a ** strike with which two or more a part of screw threads gear will be started.
[0005]In the conventional motor cylinder 101, power sometimes reaches a transverse direction (it is hereafter expressed as a "radial direction") plentifully to the thrust rod 109 in the case of stroke operation. For example, it is because attachment which doubled the position of the center may not be correctly performed immediately after carrying out the product made from new when a user attaches this motor cylinder 101 to a load machine, even if the problem of a ** strike mentioned above since parts were processed correctly does not arise. Therefore, if the power of a big radial direction acts on the thrust rod 109, excessive power will be added to the metal bearing 113 and the radial road carrier 114 which exist inside the bracket 112, and advance of wear will become that toward which the wear moreover inclined early.
[0006]Then, if the metal bearing 113 and the radial road carrier 114 are worn out with the power of this radial direction, a load machine and the motor cylinder 101 will be in the state where what is called Najimy stuck with the center shifted. In order that the thrust rod 109 may perform in this operation which removed the center, A ** strike will arise in engagement of the female screw formed in the male screw 106a and the thrust nut 108, and the problem that an allophone cannot be emitted too, or generation of heat and anomalous attrition by an oil film piece happen, and sufficient function cannot be exhibited will be caused.
[0007]Although use of the motor cylinder 101 will repeat a high speed, a low speed, and operation of a stop in the usual all seems well, abnormalities may arise in the other party's load machine on which this motor cylinder 101 acts, or abnormalities may arise in the sensor and control machinery of the motor cylinder 101. In such a case, while it has been in the high-speed state where driving torque was applied from the drive motor 102, a collision may arise, and excessive impulse force is added to each component parts in the motor cylinder 101, and makes endurance to damage or fall to them remarkably. That the loss by prudence of the thrust generated in the thrust nut 108 should be lessened as much as possible in the motor cylinder 101, and it should transmit to the binder metal of an outputting part the path of the thrust rod 109, It constituted in thin ** to such an extent that the inside diameter did not touch the outer diameter of the male screw 106a, and it was formed within the outer diameter from the

inside diameter of the thrust nut 108. However, it had become a cause of the cost hike by using heavy-gage material as a steel pipe, since rigidity then becomes low structurally, carrying out chrome plating to rust prevention and abrasion proof in connection with it in an outer diameter surface, and honing also to inner diameter surface processing.

[0008]Then, an object of this invention is to provide [both] the rigid high and cheap motor cylinder which maintains the good engagement of a thread part with a thrust nut and a thrusting shaft that this problem should be solved.

[0009]

[Means for Solving the Problem]A thrusting shaft which a motor cylinder of this invention was supported enabling a drive motor which gives a rotational output, and free rotation in a frame, and was provided with a male screw, A drive means of communication which transmits a rotational output of said drive motor to said thrusting shaft, A thrust nut provided with a female screw screwed in a male screw of said thrusting shaft, It has the thrust rod which covered with said male screw and protruded on shaft orientations from said frame enabling free sliding, Said thrust rod which made a major diameter and was formed from said thrust nut holds said thrust nut according to frictional force to shaft orientations between a suspending portion formed in the medial surface, and a locking member which fitted into an end.

[0010]Therefore, a rotational output of a drive motor is transmitted to a thrusting shaft via a drive means of communication, and torque is given to a thrusting shaft. Rotation of a thrusting shaft is transmitted as a thrust to a thrust nut via a female screw of a male screw formed in it, and a thrust nut to screw. Therefore, by rotation of a drive motor, a thrust is transmitted to a thrust nut and a shaft-orientations output to a thrust rod is obtained via a thrust nut. Since a thrust nut is held by frictional force of shaft orientations to a thrust rod at this time, when a center of a thrust rod and a thrusting shaft has shifted, and a thrust nut moves to a radial direction etc. (floating), a state of a thread part with a thrusting shaft is good -- it bites and ** is maintained. And rigidity can become high by major-diameter-ization, therefore thinning of a thrust rod of a major diameter holding a thrust nut can become possible, and it can lessen loss of power by prudence, and can lessen a material cost.

[0011]A thrusting shaft which a motor cylinder of this invention was provided with a drive motor which gives a rotational output, and a male screw, and was supported in a frame enabling free rotation, A drive means of communication which transmits a rotational output of said drive motor to said thrusting shaft, A thrust nut with a flange provided with a female screw screwed in a male screw of said thrusting shaft, Have the thrust rod which covered with said male screw and protruded on shaft orientations from said frame enabling free sliding, and said thrust nut, A locking member fixed to said thrust rod side to a breakthrough drilled by flange with which it was loaded with axial clearance fits in loosely, and said thrust rod is characterized by being the cylinder body which made a flange outer diameter of said thrust nut, and of approximately the same diameter, and was formed. Therefore, also in this motor cylinder a thrust nut, since shaft orientations are loaded with a crevice to a thrust rod, when a center of a thrust rod and a thrusting shaft has shifted, and a thrust nut moves to a radial direction etc. (floating), a state of a thread part with a thrusting shaft is good -- it bites and ** is maintained. And rigidity can become high by major-diameter-ization, therefore thinning of a thrust rod of a major diameter holding a thrust nut can become possible, and it can lessen loss of power by prudence, and can lessen a material cost.

[0012]As for a motor cylinder of this invention, said thrust rod is formed with a light metal. Therefore, if a thrust rod is used as an aluminum pipe etc., a pipe can be formed with sufficient accuracy at one process by extruding, Since rust prevention to an outside surface and the degree of case hardening of an outer diameter surface which becomes unnecessary, also makes planar pressure to a metal side small by major-diameter-ization, and is needed can be made low, a price of the motor cylinder itself can be lowered by making a thrust rod cheap.

[0013]

[Embodiment of the Invention]Next, the 1 embodiment of the motor cylinder concerning this invention is described concretely. Drawing 1 is a sectional view showing a 1st embodiment of a motor cylinder. Although the motor cylinder 1 of this embodiment makes the same composition as the thing of said conventional example, and many portions, it explains the details anew. The drive motor 2 with which the motor cylinder 1 was provided with NB brake (deenergisation operation type electromagnetic brake) as a driving source is used, and the rotary encoder 3 is attached to the drive motor 2. Therefore, the signal of the rotary place of the drive motor 2 can be sent electrically, it continues throughout a stroke, the position of a thrust rod can be checked, and it can position by a multipoint in arbitrary positions. And the driving-side sprocket 4 has fitted into the output shaft 2a.

[0014]As for the drive motor 2, the timing belt 7 is stretched between the driving-side sprockets 6 which the driving-side sprocket 4 fitted in and fitted into the thrusting shaft 21.And the driving-side sprocket 6 is supported by the sprocket shaft carriers (ball bearing) 8 and 8 in this motor cylinder 1, enabling free rotation. While a female spline is provided in the driving-side sprocket 6 inner skin, the male spline was provided in the peripheral face of the thrusting shaft 21, and both have geared. Therefore, the thrusting shaft 21 has movement in a free state in shaft orientations, while rotation is restricted to the driving-side sprocket 6. A spline is good also as a polygonal (hexagon) slide, a slide of a reverse-key shaft, etc. These are covered with the covering 5.

[0015]The thrusting shaft 21 is supported by the ball bearings 11 and 11, enabling free rotation, and the spring 12 to which precompression load is applied is fitted in among the ball bearings 11 and 11. The precompression load by this spring 12 is set up above the rated thrust, and when the rated thrust is generated in the usual feeding operation, the spring 12 makes exact positioning delivery possible, without bending from the deflection beyond precompression load. The ball bearings 11 and 11 are constituted so that it may slide only in the direction which an inner ring and an outer ring of spiral wound gasket can especially slide [as opposed to / both / movement of the shaft orientations of

the thrusting shaft 21] now, and counters mutually with the level difference part and stop ring of the thrusting shaft 21.

[0016]As for the thrusting shaft 21, the male screw 21a is installed and rotation support of the tip is carried out to the ball bearing 13. The male screw 21a constitutes a ball screw, and the spiral U-shaped gutter is cut so that the ball held at the female screw 22a side of the thrust nut 22 may roll. Therefore, as for the thrust nut 22, the female screw 22a is screwed in the male screw 21a of the thrusting shaft 21 with the ball screw. The male screw 21a and the female screw 22a may be slide screw threads. The inner skin is in the peripheral face of the ball bearing 13, and the loose fit state, and the thrust rod 23 is supported by the metal bearing 14 so that the peripheral face can slide on drawing right and left lightly. The fitting 24 which can be connected is attached at the tip of the thrust rod 23 to the unillustrated load machine.

[0017]By the way, this motor cylinder 1 is making the floating structure (it mentions later for details) combined by frictional force to the thrust rod 23 so that the thrust nut 22 might not rotate. That is, the thrust nut 22 is held at one at the thrust rod 23, where precompression load is applied as follows to shaft orientations. The thrust rod 23 is a pipe member of a major diameter that it should cover with the thrust nut 22, and is formed with the aluminum pipe. It is inserted so that it may cover from the tip of the thrusting shaft 21, and the thrust rod 23 is a wrap about the thrust nut 22. The coupling 25 has fitted into the inserting-ends part of the thrust rod 23. The thrust carrier washer 26 is fixed to the medial surface of the thrust rod 23.

[0018]And precompression load is applied to the coupling 25 by the belleville spring 27 by which the thrust carrier washer 26 side was loaded with the thrust nut 22 with which it was loaded between the thrust carrier washer 26 and the coupling 25, and it is pressed, and is held. The pin 28 of baffle prevention is fixed to the friction surface of the thrust nut 22 which contacted the coupling 25, and the pin hole 25a which can be inserted by a noncontact state is formed in the coupling 25 in the pin 28. Therefore, the thrust nut 22 of this embodiment was screwed in coupling like the thing of the conventional example mentioned above, was not concluded firmly, and is formed by floating structure.

[0019]The bracket 30 fits in at the tip of the frame 29 formed so that the thrusting shaft 21, the thrust rod 23, etc. might be covered, and it is constituted so that the thrust rod 23 may be supported by the metal bearing 30. In order to detect the moving origin position of the thrust rod 23, the permanent magnet 31 is attached to the thrust rod 23, and the magnetic sensors 32A and 32B which detect the position of the permanent magnet 31 are attached to the prescribed position of frame 29 periphery at this motor cylinder 1. And the rubber cushions 33 and 33 for softening the shock of the high-speed collision by an abnormal condition are attached as a stopper. The thrust value dispatch magnet 35 for detecting movement of the shaft orientations of the thrusting shaft 21 is fixed to thrusting shaft 21 end by this motor cylinder 1, and the covering 5 is equipped with the magnetic sensor 36 which detects the position of the thrust value dispatch magnet 35 at it.

[0020]Here, the floating structure of the thrust nut 22 is explained. In the motor cylinder 1 of this embodiment, while the thrust rod 23 screws like a conventional example to the coupling 25 and is concluded firmly, the thrust nut 22 is held with the coupling 25 and the thrust rod 23, and it is loaded with it in the free state. Since the size of the thrust rod 23 is formed so that it may be a major diameter and may become non-contact from the outer diameter of the thrust nut 22, a crevice is formed in a radial direction. Since a larger distance of the thrust carrier washer 26 and the coupling 25 than the axial dimension of the thrust nut 22 is also taken, the crevice is formed also in shaft orientations (the crevice between these is called "floating crevice").

[0021]However, since precompression load is applied by the belleville spring 27 with which it was loaded into the thrust rod 23, the thrust nut 22 is pressed to the coupling 25, and is in the state where it was combined with the thrust rod 23 by frictional force. Therefore, it is constituted so that the thrust nut 22 and the thrust rod 23 may transmit power united with floating structure according to frictional force. This belleville spring 27 is designed so that the precompression load exceeding the rated thrust received from a load machine (load) may be applied, and the positioning accuracy of the thrust nut 22 is maintained. Therefore, axial clearance serves as zero seemingly by the belleville spring 27 among floating crevices, and unless the excessive power exceeding the precompression load by the belleville spring 27 is added between the thrust nut 22 and the thrust rod 23, axial clearance occurs.

[0022]By the way, the power Ff of holding the thrust nut 22 to the power concerning a radial direction is Ff **mu1x precompression load x2 (since frictional resistance arises to both sides of the thrust nut 22).

It is come out and expressed. Since the value of the frictional resistance mu 1 is about 0.1 between metal in many cases, the thrust nut 22 will be held by about about 1/5 small power of precompression load. Therefore, with light power, the thrust nut 22 can slide on a friction surface with the coupling 25, and can carry out floating of the inside of the thrust rod 23 to a radial direction. Therefore, even if the state where the center of the male screw 21a of the thrusting shaft 21 and the thrust rod 23 shifts arises, the motor cylinder 1 of this embodiment is constituted so that the male screw 21a and the female screw 22a may always cause sufficient engagement by floating of the thrust nut 22.

[0023]The motor cylinder 1 of this embodiment which consists of such composition will operate as follows. If the drive motor 2 drives the motor cylinder 1 and the output shaft 2a rotates, the rotation will be transmitted to the driving-side sprocket 6 via the timing belt 7 from the driving-side sprocket 4. The rotational output transmitted to the driving-side sprocket 6 serves as rotation of the direct thrusting shaft 21. At this time, the rotational output of the drive motor 2 slowed down the rotation given to the thrusting shaft 21 in the driving-side sprocket 6 by the gear ratio of the driving-side sprocket 4 and the driving-side sprocket 6, and it increased torque (it accelerates and torque may be decreased).

[0024]The thrusting shaft 21 to which rotation was given is supported by the ball bearings 11, 11, and 13, and rotates. If the male screw 21a formed in it when the thrusting shaft 21 rotated also rotates and the male screw 21a rotates, a thrust will be given to the thrust nut 22 which has this and the screwed female screw 22a. Since the thrust nut 22 is constituted so that it may not corotate according to frictional force, it is because the torque of the male screw 21a is given as power of shaft orientations by a thread part to the thrust nut 22.
[0025]By giving rotation of a determined direction to the thrusting shaft 21, the thrust nut 22 promotes to a drawing left. The thrust of the thrust nut 22 is transmitted to the thrust rod 23 with the thrust concerning the belleville spring 27. Then, the thrust rod 23 will move to shaft orientations, and the straight-line motion to a drawing left will be outputted to the load machine which is not illustrated [which was combined with the fitting 24]. In this case, since it is applied to the thrust nut 22 in the precompression load which exceeds a rated thrust by the belleville spring 27, the belleville spring 27 does not bend and a crevice is not vacant in shaft orientations. If counterrotation is given to the thrusting shaft 21, the thrust nut 22 will promote to the method of the drawing right, and a thrust will be directly transmitted to the coupling 25 with the thrust nut 22. Therefore, the thrust rod 23 of one will move to the coupling 25 to shaft orientations, and the straight-line motion to the method of the drawing right will be outputted to the load machine which is not illustrated [which was combined with the fitting 24].
[0026]On the other hand, it is difficult to double the center of the thrusting shaft 21 with a load machine in the stroke whole region in many cases, when a load machine is made to conclude the fitting 24. Therefore, in the thrust rod 23, the radial bearing 34 moving reciprocately and which power was moreover added to imbalance in many cases, and fitted into the radial direction continuously working at the metal bearing 14 and the coupling 25 will be worn out. And the level where wear was stopped and stabilized, and after what is called Najimy has stuck, it means that wear advanced till the place which a gap produces in the center of a load machine and the thrusting shaft 21.
[0027]However, such even case, in the motor cylinder 1 of this embodiment. Since the thrust nut 22 is in floating held by small power to the coupling 25 in the radial direction, only by the position of the coupling 25 and the thrust nut 22 shifting, A state with good engagement of the female screw 22a of the thrust nut 22 and the male screw 21a of the thrusting shaft 21 is maintained. A state with good engagement of the female screw 22a of the thrust nut 22 and the male screw 21a of the thrusting shaft 21 is maintained because the belleville spring 27 bends asymmetrically and the angle of the thrust rod 23 amends a gap of an angle also at the time of fine amount ******.
[0028]It is also the same as when a gap of a center and a minute angle gap with the thrusting shaft 21 and the thrust rod 23 which are produced, for example when the machining accuracy of parts does not come out arise. Therefore, when such a center gap and a minute angle gap arose, in the conventional motor cylinder, durable performance fell remarkably by the ** strike of the thread part which causes an allophone and an abnormal heat generation, but in the motor cylinder 1 of this embodiment, high durable performance can be obtained by good engagement. In particular, in a motor cylinder, since the meshed part of a screw thread determines durable performance, this motor cylinder 1 can acquire high reliability.
[0029]By the way, in this motor cylinder 1 which takes the floating structure combined by frictional force, the holding power between the thrust nut 22 is considered, without concluding the thrust nut 22 with the thrust rod 23. First, the hold torque Tf of the thrust nut 22 can be expressed as Tf **mu1x precompression load xRs x(radius of contacting parts of belleville spring)2**0.2x precompression load xRs. Next, corotation torque Tb which starts the thrust nut 22 by a ball screw section in the thing using the small ball screw of the lead adopted as the motor cylinder of this above-mentioned embodiment in many cases is Tb **mu2x rated thrust xRb (ball screw effective radius).
It comes out, it is, and since it is about mu2**0.01, the value of Tb is dramatically small.
[0030]Although these are expressed with the rough value, since they are the levels of Rs **Rb, in the case of the motor cylinder 1, the ratio of the hold torque Tf of the thrust nut 22 and corotation torque Tb is Tf / Tb **(0.2x rated thrust xRs)/(0.01x rated thrust xRb).
It is set to **20 and it turns out that the hold torque Tf of the thrust nut 22 is large. Therefore, in many cases, the thrust nut 22 does not corotate with rotation of the thrusting shaft 21.
[0031]Therefore, a thrust will be given to the motor cylinder 1 to the thrust rod 23, without the thrust nut 22 usually corotating with the thrusting shaft 21 at the time of operation. On the other hand, just as the impact resistance value of corotation torque Tb exceeds the hold torque Tf when an abnormal condition should occur and it collides with a mate machine or a work with high-speed operation since the hold torque Tf is a finite value, the thrust nut 22 corotates with the thrusting shaft 21, and controls an impact resistance value to a limited value. Therefore, the torque limit operation which does not require load with the thrusting shaft 21 impossible for will be demonstrated.
[0032]Thus, although the thrust nut 22 promotes and a straight-line motion is outputted to a load machine etc. by rotation of the drive motor 2, when abnormalities arise and a collision takes place with high speed driving, the straight-line motion of the thrust rod 23 is stopped compulsorily. That is, since movement of shaft orientations is restricted, the thrust nut 22 corotates with the thrusting shaft 21, but when the pin 28 hits the side of the pin hole 25a, it stops a friction surface with the coupling 25 in the place in which only the specified quantity carried out the rotation slide. On the other hand, the power which it is going to rotate further by the driving torque of the drive motor 2 and the kinetic energy currently stored in the drive system commits the thrusting shaft 21.
[0033]So, in the motor cylinder 1 of this embodiment, since the thrusting shaft 21 is supported by the ball bearings 11 and 11 which slide on shaft orientations, the inside of the thrust nut 22 is spiraled. In order that it may **** with number of rotations at this time and the thrusting shaft 21 may move to shaft orientations in a led part, one ball bearing 11 will be pushed and the spring 12 will bend. And when the thrusting shaft 21 moves to shaft orientations,

the magnetic sensor 36 induces a motion of the thrust value dispatch magnet 35, an ON signal is sent, the drive motor 2 is turned off, and it is stopped by NB brake.
[0034]Therefore, when colliding with a mate machine or a work with high-speed operation, the peak value of impulse force is controlled by absorbing the impulse force of each part produced by restricting movement of the thrust rod 23 with the spring 12 which is an inertia absorption elastic body. By therefore, the thing for which rotation of the thrusting shaft 21 is consumed as screw motion even when the transfer of continuous power with the thrusting shaft 21 and the thrust nut 22 is severed during the drive of the drive motor 2. Without damaging the pin 28 for baffle prevention, the burden to each power transmission device will also be eased, and breakage will be avoided. At this time, also by the cushions 33 and 33, a big shock is eased and breakage is prevented.
[0035]In this motor cylinder 1, it presses only not only in positioning (spasm), and operation is also possible. That is, the angle of rotation of the drive motor 2 is controlled by the signal of the rotary encoder 3, if a work is brought close and approached at high speed, it will switch to low-speed torque, and the thrust rod 23 is pressed against a work (spasm), and driving torque is applied as it is. According to the reaction force received from a work, it stops, the thrusting shaft 21 moves to shaft orientations similarly with having been shown previously, and the thrust rod 23 sags the spring 12. The magnetic sensor 36 which induced the thrust value dispatch magnet 35 in the state of the predetermined deflection sends an ON signal. And after NB brakes are applied previously and the drive motor 2 has an effective brake with this ON signal, it will be turned off and it will stop. In this state, by ****** which is going to restore the spring 12, the thrust rod 23 is pushed to a work (drawn), it will also force no energizing with the strain power of that elastic body (spasm), and a thrust will be generated.
[0036]Therefore, the motor cylinder 1 of such this embodiment is having constituted the thrust nut 22 according to floating structure, and was able to maintain the good engagement with the male screw 21a female screw 22a. Since the thrust rod 23 was formed by the pipe member of a major diameter which covers the thrust nut 22, compared with the conventional thing, rigidity improved substantially. Therefore, it was able to replace with the expensive chromium plating pipe used for the thrust rod 23 so far, and could be made the light-gage aluminum pipe, and price mitigation was able to be attained. That is, it can conclude that the rigidity of the same light-gage pipe of material is proportional to the 4th power of the outer diameter D mostly from the section modulus of a cylinder body, and it can be concluded that the weight of the same light-gage pipe of material is proportional to the cylinder body outer diameter D mostly if thickness is made the same. Therefore, it can be concluded that prudence and its rigid ratio of a light-gage pipe are proportional to the cube of the outer diameter D mostly. Therefore, even if it is effective to enlarge a path when lessening material, with rigidity improved, and it uses light metals, such as an aluminum pipe, it turns out that required rigidity is securable.
[0037]As shown in drawing 2, since the thrust rod 109 was formed in the byway, by the conventional motor cylinder, the expensive needle bearing 115 had to be used for the rotation support member fitted in between the thrusting shafts 106. However, in the motor cylinder 1 of this embodiment, it became usable [the cheap ball bearing 13] by having made the thrust rod 23 into the major diameter, and price decline was able to be realized also from this point. By the ability of the thrust rod 23 to have been replaced with the light-gage aluminum pipe, weight reduced, the invalid loss at the time of delivery by prudence mitigation decreased, and the thrust effect increased.
[0038]As mentioned above, although the 1 embodiment of the motor cylinder was described, various change is possible for this invention in the range which is not necessarily limited to this thing and does not deviate from the meaning. For example, the thrust rod in which an applicant for this patent makes the feature of this application to the thrust nut of various floating structure indicated to Japanese Patent Application No. No. 075874 [nine to] which applied previously is applicable. That is, the precompression load of the belleville spring 27 is abolished and it may be made to support the example by a locking member, as shown in drawing 2. The through hole 52b penetrated to shaft orientations is specifically drilled by the flange 52a of the thrust nut 52 screwed in the thrusting shaft 51, The thrust rod 53 is supported when the shoulder bolt 55 which was fixed to the coupling 54 and fixed to the coupling 54 penetrates the through hole 52b. The infinitesimal gap a is established in shaft orientations at the flange 52a of the thrust nut 52, and the crevice which permits a gap of the hand of cut of the thrust nut 52 and a radial direction between the shoulder bolts 55 is provided in the through hole 52b. And also in this case, the thrust rod 53 is formed by a major diameter, and is mostly formed with the thin cylinder objects (aluminum etc.) of the equal diameter with the flange 52a outer diameter of the thrust nut 52.
[0039]
[Effect of the Invention]The thrusting shaft which this invention was supported enabling the drive motor which gives a rotational output, and free rotation in a frame, and was provided with the male screw, The thrust nut provided with the female screw which screws the rotational output of a drive motor in a drive means of communication transmitted to a thrusting shaft, and the male screw of a thrusting shaft, It has the thrust rod which covered with the male screw and protruded on shaft orientations from the frame enabling free sliding, Since the thrust rod which made the major diameter and was formed from the thrust nut does as the locking member which fitted into the suspending portion formed in the medial surface, and the end and held the thrust nut according to frictional force to shaft orientations, It became possible to provide the motor cylinder high [rigidity] and cheap [both] which maintains the good engagement of a thread part with a thrust nut and a thrusting shaft.
[0040]The thrusting shaft which this invention was provided with the drive motor which gives a rotational output, and the male screw, and was supported in the frame enabling free rotation, The thrust nut with a flange provided with the female screw which screws the rotational output of a drive motor in a drive means of communication transmitted to a thrusting shaft, and the male screw of a thrusting shaft, Have the thrust rod which covered with

the male screw and protruded on shaft orientations from the frame enabling free sliding, and a thrust nut, The locking member fixed to the thrust rod side to the breakthrough drilled by the flange with which it was loaded with axial clearance fits in loosely, and a thrust rod, Since it was the cylinder body which made the flange outer diameter of a thrust nut, and of approximately the same diameter, and was formed, it became possible to both provide the rigid high and cheap motor cylinder which maintains the good engagement of a thread part with a thrust nut and a thrusting shaft. Since a thrust rod was formed with a light metal, this invention became possible [providing the motor cylinder made cheap].

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

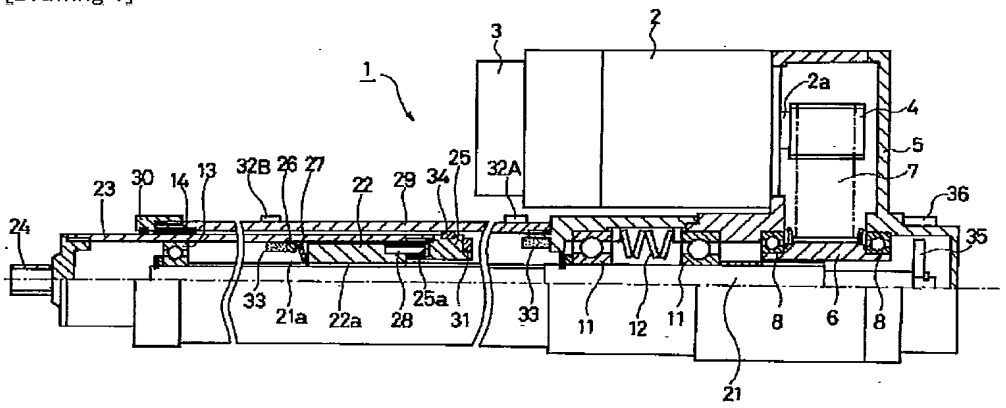
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a sectional view showing the 1 embodiment of the motor cylinder concerning this invention.
[Drawing 2]It is a fragmentary sectional view showing another embodiment of the motor cylinder concerning this invention.
[Drawing 3]It is a sectional view showing the conventional motor cylinder.
[Description of Notations]
1 Motor cylinder
2 Drive motor
4 Driving-side sprocket
6 Driving-side sprocket
7 Timing belt
21 Thrusting shaft
21a External threaded section
22 Thrust nut
22a Female screw
23 Thrust rod
24 Fitting
25 Coupling
26 Thrust carrier washer
27 Belleville spring
29 Frame

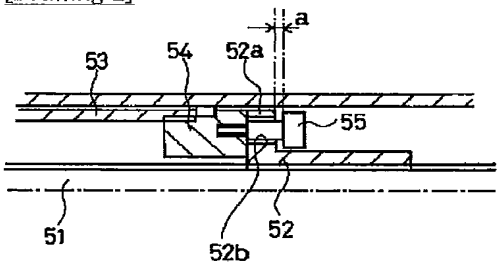
[Translation done.]

DRAWINGS

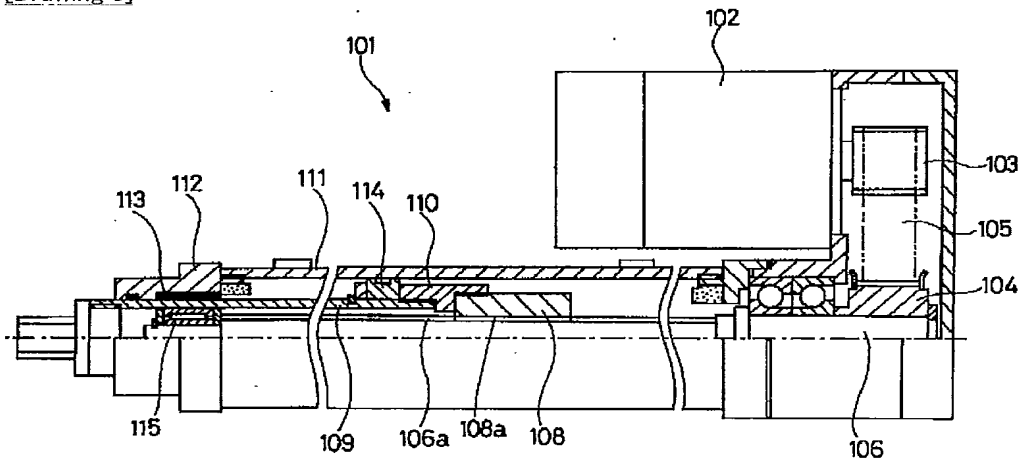
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]

拒絶理由通知書

特許出願の番号	特願２００２－５５７８１８
起案日	平成２０年　１月２２日
特許庁審査官	竹村　秀康　　３５２４　３Ｗ００
特許出願人代理人	細田　益稔（外　２名）　様
適用条文	第２９条第２項、第３６条

この出願は、次の理由によって拒絶をすべきものです。これについて意見がありましたら、この通知書の発送の日から３か月以内に意見書を提出してください。

理　由

Ａ．この出願の下記の請求項に係る発明は、その出願前に日本国内又は外国において、頒布された下記の刊行物に記載された発明又は電気通信回線を通じて公衆に利用可能となった発明に基いて、その出願前にその発明の属する技術の分野における通常の知識を有する者が容易に発明をすることができたものであるから、特許法第２９条第２項の規定により特許を受けることができない。

記　　（引用文献等については引用文献等一覧参照）

・請求項１
・引用文献１
・備考

本願の請求項１に係る発明と引用文献１に記載された発明とを比較すると、両者は以下の点で相違し、残余の点で一致する。

本願の請求項１に係る発明では、「アクチュエータを介して少なくとも１つのブレーキケーブルから減結合された態様で決定される」のに対し、引用文献１に記載された発明では、（アクチュエータの構成部材となる）連結部材１９と従動ケーブル２１とが係合されているものの減結合された態様であるか不明である点（以下、「相違点１」という）。

なお、引用文献１に記載された発明の認定については、該引用文献１の特に段落番号【００１８】、【００２８】、第１図を参照のこと。

上記相違点１について検討すると、ベアリングワッシャ（スラストワッシャ）等を用いて２部材間の回転吸収（ねじれ防止）を行うこと自体は、例示するまでもなく慣用技術である。してみれば、引用文献１に記載された発明に、上記慣用技術を適用し本願の請求項１に係る発明のようにしたことに格別の困難性は認め

られない。

・請求項２
・引用文献１
・備考
　第１図を参照のこと（特に、モータM、第１ギア１０、アイドラギア１５を参照のこと）。

・請求項４
・引用文献１、２
・備考
　引用文献２には、駆動モータ２（アクチュエータ）、伝達手段４、６（歯車）、推力シャフト２１（スピンドル）、推力ナット２２（ナット）を備えた作動機構が示されている（特に、第１図を参照のこと）。
　引用文献１における作動機構に代えて引用文献２の作動機構を適用し本願の請求項４に係る発明のようにしたことに格別の困難性は認められない。

・請求項１０
・引用文献１、２
・備考
　引用文献２を参照のこと（特に、第１図を参照のこと）。

　Ｂ．この出願は、特許請求の範囲の記載が下記の点で、特許法第３６条第６項第２号に規定する要件を満たしていない。

記

　請求項１において、「…減結合された態様で…」とあるが、「減結合」とは何を意味するものであるのか不明である（「減結合（decoupled）」は、電気回路に係る分野でよく用いられる用語であるが、機械に係る分野では不適切な用語ではないか）。
　よって、請求項１に係る発明は明確でない。

＜拒絶の理由を発見しない請求項＞
　請求項３、５－９、１１－２３に係る発明については、現時点では、拒絶の理由を発見しない。拒絶の理由が新たに発見された場合には拒絶の理由が通知される。

引　用　文　献　等　一　覧

１.特開２０００－２１１４８５号公報

２.特開平１１－０８９１６９号公報

＜補正等の示唆＞

（１）明細書を補正した場合は、補正により記載を変更した個所に下線を引くこと（特許法施行規則様式第１３備考６）。

（２）補正は、この出願の出願当初の明細書又は図面に記載した事項のほか、出願当初の明細書又は図面に記載した事項から自明な事項の範囲内で行わなければならない。補正の際には、意見書で、各補正事項について補正が適法なものである理由を、根拠となる出願当初の明細書等の記載箇所を明確に示したうえで主張されたい。（意見書の記載形式は、無効審判における訂正請求書の記載形式を参考にされたい。）

－－

先行技術文献調査結果の記録

・調査した分野　　Ｆ１６Ｄ　４９／００　－７１／０４
　　Ｂ６０Ｔ　１３／００　－１３／７４
　　Ｆ１６Ｈ　１９／００　－３７／１６
　　Ｆ１６Ｈ　４８／１２
　　Ｆ１６Ｈ　４９／００

・先行技術文献　　特開平０１－１４８６５１号公報

この先行技術文献調査結果の記録は、拒絶理由を構成するものではない。

－－

この拒絶理由通知の内容に関するお問い合わせ、または面接のご希望がございましたら下記までご連絡下さい。

特許審査第二部一般機械　特許審査官 竹村 秀康
ＴＥＬ．０３（３５８１）１１０１　内線３３６８
ＦＡＸ．０３（３５８０）６９０４